

SOME OBSERVATIONS ON THE LIFE HISTORY OF
THE TOMATO PSYLLID (*PARATRIOZA*
COCKERELLI SULC.) (HOMOPTERA)

BY RUSSELL S. LEHMAN, M. S.

The experiments in this investigation were conducted in the insectary of the Colorado Agricultural College under the supervision of Dr. C. P. Gillette. The tomato psyllid is only occasionally injurious in Colorado. In addition to being injurious to the tomato plant, the insect is also found occasionally in large enough numbers to be injurious to the potato plant.

METHOD OF PROCEDURE

The psyllids used for this investigation were obtained from the college greenhouse and they were allowed to infest tomato plants about two feet high of the climbing variety. The psyllids on these plants were then allowed to multiply. These were used as a source of material for conducting individual observations which were performed as follows. The adult females were placed in glass tubes about ten inches long and four inches in diameter closed at both ends with cheese cloth. A fresh tomato leaf was placed in each of these tubes every day until eggs were laid and then fresh leaves for the nymphs when they emerged. Two series of experiments were conducted with small tomato plants covered with a glass chimney. Several females were confined and then removed after the eggs were laid. Observations were also made on the large tomato plants. In the two series of experiments mentioned, observations were made every few hours so that an accurate account of the habits, egg laying, and the length of the instars was obtained.

RESULTS AND DISCUSSION

The results given in table I were conducted in the insectary where there was a wide range of temperature from 10° to 35° C., while those in table II were conducted at a temperature of from 16° to 27° C.

TABLE I

Cage	Length of egg stage		Ave. length of egg stage		Plant	Life of nymphs		Ave. life of nymphs	Tube	Life of adult	
	Days	Hrs.	Days	Days		Days	Days			Days	Days
3	6-7		6-7		2	29	24	2	13		13
5	6-7				1	22-23		3	10		10
7	6	4			3	28		5	9		9
Tube	6	3			Cage	18		6	19		19
	6					6	22-23		7	13	
8	6				8			12	10		10
10	6-7							15	14		14
15	6	6						16	13		13
16	7							17	15		15
17	7	3									

TABLE II

Cage	Length of egg stage		Life of nymphs		Length of stadia											
	Days	Hrs.	Days	Days	1st		2nd		3rd		4th		5th		6th	
					Days	Hrs.	Days	Hrs.	Days	Hrs.	Days	Hrs.	Days	Hrs.		
1	5	12	16	3	21	3	3	1	1	1	1	1	1	1	1	1½
2	5	5	17	3	20	3	3	1	20	1	1	1	4			

In cage 1 the adults appeared four days twelve hours after the sixth molt. The adults laid eggs three days after emergence. The length of the life cycle in cage 1 was therefore twenty-five days from the time the egg was laid until the adult deposited an egg.

In cage 2 the adults died before eggs were deposited. This was probably because of starvation, since the plant on which they were had withered.

THE EGG

Although the eggs were observed most anywhere on the leaf and stem, they are usually deposited near the edge on the upper surface of the leaf, and always on a stalk. One of the females which was confined in a tube laid an egg on the cork. An egg deposited on the glass of the tube was also observed. In addition to eggs being found on the leaves and stems of growing plants, they were also noticed on the calyx of the tomato. The number of eggs deposited by a female at one laying varies considerably, but deposits of a dozen were frequently observed.

The eggs, elliptical in shape, are a light yellowish color when first deposited except for one end being orange in color. As the eggs become older they turn more of an orange color. The following data shows measurements that were made of the eggs about ready to hatch.

Egg	Length in mm.	Width in mm.
1	.33	.155
2	.357	.148
3	.33	.155
4	.345	.142
5	.345	.155

The length of the stalk to which the egg is attached is .213 mm. The adult is usually able to deposit an egg in a minute or two, but sometimes the female seems to have difficulty in deposition of the egg and the time required may be five or more minutes.

Eggs that are not fertile do not seem to hatch but appear to dry up. Much more data would have to be obtained on this before definite conclusions could be drawn since temperature conditions may have affected the results.

THE NYMPHS

The nymphs upon hatching are yellowish in color with the posterior end orange. They have three pairs of legs and two projecting horns on the ventral surface near the head. The nymphs seem to be ready to feed immediately upon emergence from the egg. They seem to prefer the under surface of the leaf and usually move to the under surface if the eggs were deposited on the upper surface. The nymphs do not usually move around very much, but they were observed leaving a perfectly good leaf which was not very crowded. If the leaf becomes withered, they will immediately move to another leaf or the stem.

The data given below is measurements of the nymphs in different stages.

The number of molts seems to depend upon the food supply and temperature. The highest number of molts observed was six, and the fewest four. The length of each stadium has been given in the first table of observations. The nymph changes to a green color after the third molt. The nymph does a lot of wiggling but the reason for this was not determined. However this wiggling occurred just before they were ready to molt and was probably to loosen the skin before molting.

THE ADULT

The adult upon emergence from the last nymphal skin is green in color. The wings, which were white with slight brownish color, were folded under and appeared to be blown up. Four minutes after emergence the tips of the wings were still brownish in color. The eyes, which appeared to be lavender in color, were at the front, but five minutes after emergence they were at the side of the head. The body was green with the legs practically colorless with the exception of a slight brownish tinge. Eight minutes after emergence the wings were colorless. Ten minutes after emergence the wings were entirely expanded. The adults which are green upon emergence turn brown the second day and the third day they are black. This is their normal development. If the adult is injured or its wings are caught they may not change to a black color for as long as a week.

Nymph	Nymphs not over 15 hours old			Nymphs after first molt		Nymphs after last molt	
	Length	Width at eyes	Width at widest part	Length	Width at widest part	Length	Width at widest part
1	.381 mm.	.19 mm.		.541 mm.	.333 mm.	1.791 mm.	1.125 mm.
2	.381 "	.19 "		.583 "	.333 "	1.833 "	1.125 "
3	.357 "		.213 mm.				
4	.369 "		.213 "				
5	.381 "		.213 "				

Nymph	Nymph yellow, about ready to turn green		Nymphs just turned green	
	Length	Width at widest part	Length	Width at widest part
1	.958 mm.	.583 mm.	1.083 mm.	.75 mm.

In copulating the male and female are alongside of each other and the male twists its abdomen around to the female.

The adult measures 2.75 mm. from the head to the tip of the wing. The length of the body varies from 1.333 mm. to 1.666 mm.

The following table gives data collected on the egg laying of the females.

Tube	No. of eggs	Length of life
3	55	10 days
6	60	19 "
16	93	15 "

The female is not easily disturbed from her egg laying. She seems very intent on depositing the egg regardless of the circumstances or annoyances that may occur.

CONCLUSION AND SUMMARY

The damage is done to the plant by the nymphs and there is not much harm to the plants if they are fairly large. The small plants are killed outright if the infestation is heavy. The leaves of the large plants wilt if the nymphs are in great numbers. *Paratrioza cockerelli* must be present in large numbers before any damage to the plant would be noticeable. Their presence is shown very clearly by a white substance exuded from the anus of the nymph and adult.

The length of the life cycle of *Paratrioza cockerelli* varies with temperature, but at a temperature of from 16° to 27° C. the complete life cycle requires 25 days. The adult female lays on an average seventy-five eggs, with an average length of life of about fifteen days.